Volume 093
Article 07

FISHERY RESEARCH

WHITE STURGEON EVALUATIONS IN THE SNAKE RIVER

Job Performance Report
Project F-73-R-15

Subproject IV, Study IV

By

Gretchen O. Kruse-Malle
Senior Fisheries Technician

November 1993

TABLE OF CONTENTS

Page

Job No. 1 White Sturgeon Evaluations in the Snake River

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

JOB PERFORMANCE REPORT

State of: Idaho

Title: White Sturgeon Evaluations in the Snake River

Project No.: F-73-R-15

Job No.: 1

Subproject No.: IV

Study No.: IV

ABSTRACT

From 25 August 1992 to 30 November 1992, we fished for white sturgeon Acipenser transmontanus from Swan Falls Dam to Brownlee Dam on the Snake River. Five thousand two hundred one hours of setline effort yielded one 190 cm white sturgeon. We were unable to collect any additional white sturgeon with 57 h of angling effort in the freeflowing section and 132 h of gillnetting effort in the Brownlee Reservoir.

From January 25 to February 28, 1993, we fished for white sturgeon broodstock in the upper end of CJ Strike Reservoir on the Snake River. With 369 h of setline effort, we caught 16 fish. We also caught an additional 15 fish on conventional angling gear. Of the 31 white sturgeon caught, 2 males, 3 stage-3 females, and 1 stage-4 female were transported to the College of Southern Idaho for spawning.

Author:
Gretchen O. Kruse-Malle
Senior Fisheries Technician

INTRODUCTION

Snake River Population Estimate

White sturgeon provide a popular catch and release sport fishery in many segments of the Snake River. The section between Swan Falls Dam and Brownlee Dam (state harvest management areas 3:Walters Ferry to Brownlee Dam, & area 4:Swan Falls Dam to Walters Ferry) contains **a** white sturgeon fishery but accounted for only 5% of the total Snake River sport catch in 1991 (Horton 1992). Based on mandatory angler catch cards, an estimated 59 white sturgeon were captured by sport anglers between Swan Falls Dam and Brownlee Dam during 1991. Little is known about the status of the white sturgeon population in this area. However, low angler catch and effort suggest population numbers are limited.

Low white sturgeon densities in areas 3 & 4 could be the result of limited habitat availability, inhibited migration due to dams, or water quality degradation from human activities. During the summer of 1990, a fish kill in area 3 resulted in 28 dead white sturgeon ranging in length from 99-220 cm. It is believed that these white sturgeon died from low levels of dissolved oxygen (Hanson et al. 1992).

The limited sturgeon data available in this river segment is insufficient to assess the status of the population or evaluate the effects of water quality. The major objective of this study is to estimate numbers of white sturgeon residing between Swan Falls Dam and Brownlee Dam on the Snake River and from CJ Strike Reservoir to Swan Falls Dam.

In 1986, members of the commercial aquaculture industry in Hagerman Valley approached the Idaho Department of Fish and Game (IDFG) with an interest in commercial white sturgeon culture. In 1987, IDFG entered into an agreement with several aquaculture units and the College of Southern Idaho (CSI) to collect Snake River white sturgeon broodstock which would be held and spawned at CSI (Patterson et al. 1992). The agreement would prevent introduction of diseases from imported white sturgeon and genetic mixing. A portion of the larvae would also be retained by IDFG for supplementation purposes and resulting larvae would be distributed among commercial interests and private industry for rearing commercial and broodstock. Broodstock collection for this project is to be conducted by IDFG yearly as needed. Collections are made in the Snake River from CJ Strike Dam to Bliss Dam. The commercial hatcheries assist with the broodstock collection.

STUDY AREA

Snake River Population Estimate

The Swan Falls Dam to Brownlee Dam study area on the Snake River is composed of 206 km of freeflowing river and 82 km of reservoir environment (Figure 1).

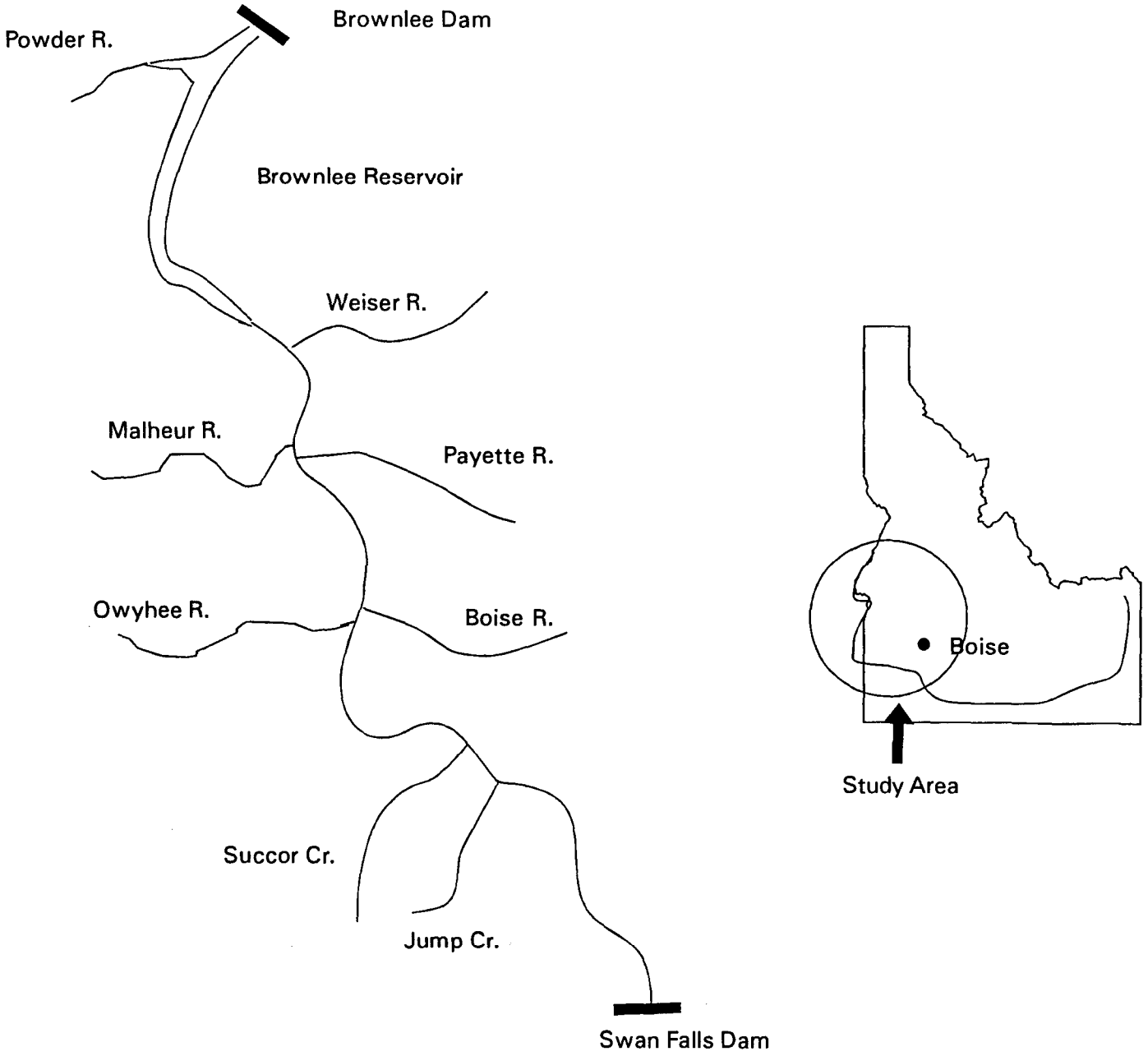

Figure 1. Snake River White Sturgeon study site - Brownlee Dam to Swan Falls Dam.

The upper 24 km of the freeflowing section are enclosed by steep canyon walls and contain some good white sturgeon habitat. In this upper area, there are 20 pools greater than 5 m deep. After dropping out of the canyon, the river opens up and water velocity decreases. This section is composed primarily of shallow riffles and runs.

Steep canyon walls rise up once again as the river enters the upper end of Brownlee Reservoir. Brownlee Dam was constructed in 1958 by Idaho Power Company for production of hydropower. The reservoir has **a** water storage capacity of 980,250 acre-feet. The entire reservoir is bordered by steep canyon walls and provides one of the highest black crappie Pomoxis niqromaculatus, white crappie P. annularis, and smallmouth bass Micropterus dolomieui sport fisheries in the state (Mabbott and Holubetz 1989).

Broodstock Collection

Broodstock collection was done in the upper end of the CJ Strike Reservoir. Depths in this section ranged from 6-20 m. The water flows slowly, but there are white sturgeon present, primarily in deep holes and shallower feeding areas inhabited by mussels.

OBJECTIVES

1. To estimate the number of white sturgeon between Swan Falls Dam and Brownlee Dam and CJ Strike Dam to Swan Falls Dam.

2. To collect broodstock for spawning at the CSI for experimental culture and studies on reproductive physiology.

METHODS

Snake River Population Estimate

Setline sampling in the freeflowing section took place from August 25, 1992 to October 27, 1992. We randomly chose a 0.2 km sample site within each 1.7 km section of the river. Each sample site was fished for 48 h using setline gear. Setline gear was composed of one 15 m length of 6.44 mm sinking braided nylon mainline with a weight and buoy line attached to each end. Six gangions equipped with 2-16/o, 2-14/o and 2-12/o circle hooks were attached to each mainline at 10 ft intervals. Hooks were baited with pickled herring, trout, liver, or shrimp. Because we did not have a collecting permit for Oregon, we did not setline sample between river mile 406 and 393.

Rod and reel sampling was used to supplement setline effort in the freeflowing section. Rod and reel gear consisted of 11 ft white sturgeon rods

equipped with 27 kg test line, 6/o J hooks attached by a 27 kg test dacron leader and a 0.11-0.23 kg lead weight. Bait varied between shrimp, trout, and pickled herring.

Gillnet sampling in the reservoir took place from November 6, 1992 to November 30, 1992. A 0.2 km site was randomly chosen within each 1.7 km. After pairing adjacent sites, sample dates for each pair were randomly chosen. Each sample site was fished for 3 h with two identical sinking gillnets for a total effort of 6 h per site. Gillnets were 1.8 m high by 46 m long. Each net contained one 28 m panel with 25 mm bar mesh and one 23 m panel with 50 mm bar mesh. The small mesh allowed for fish to become entangled but not gilled in the nets. Nets were pulled and checked every hour.

All captured white sturgeon were measured to the nearest 50 mm. A PIT tag was inserted in the muscle on the right side of the dorsal fin. The second left lateral scute was removed as an external mark to denote a PIT tagged fish. Hook size and other pertinent information were recorded.

Broodstock Collection

Collection of broodstock took place from January 25 to February 28, 1993. Both setline and angling gear were used to catch broodstock. Volunteer anglers assisted us with this white sturgeon collection effort.

Captured white sturgeon were scanned for PIT tags, measured, and tagged if unmarked. White sturgeon longer than 150 cm were sexed via surgical methods (Conte et al. 1988). Fish were transported and operated on in a stretcher. Stage-4 males and females (fully lobed and mature or ready to ripen in 1993) and stage-3 females (females which would ripen in 1994) were held for transport to CSI. We used holding tubes made of an 8 ft section of 15 in PVC as livewells. Tubes had removable gates at each end. Tubes were placed in water deeper than 1 m, weighted at one end and tied offshore at the other end. CSI personnel transported white sturgeon to the hatchery in a 1.3 m by 2 m Lumex tank equipped with an aerator system.

RESULTS

Snake River Population Estimate

After 5,390 h of effort, we caught and tagged only one white sturgeon (Tables 1 & 2). This fish was caught on a setline in the canyon area below Swan Falls Dam. We gillnetted 22 of the 49 possible sample sites in Brownlee Reservoir. Weather conditions in late November prevented us from sampling the remainder of the sites.

Table 1. Total white sturgeon fishing effort and catch by gear type from Swan Falls Dam to Brownlee Dam during Fall 1992.

Gear type	Effort (hours)	Number caught
Setline	5,201	1
Angling	57	0
Gillnet	132	0
TOTAL	5,390	1

Table 2. Length, weight, and tag number of fish caught from Swan Falls Dam to Brownlee Dam during Fall 1992.

Date	River mile	Hypural length [cm]	Weight (kg)	PIT tag number
September 3	451.4	190*	54.5	7F7D0D6772

* This fish was missing its caudal peduncle, so only hypural length was recorded.

Broodstock Collection

Fourteen females, 9 males, and 8 unsexed white sturgeon, (total of 31), were caught during broodstock collection (Table 3). Of these, one female was at stage-4 and three females were at stage-3. These four female white sturgeon and two males were transported to CSI.

Ten of the captured white sturgeon had been previously PIT tagged (Appendix A). One 162 cm fish was **a** hatchery fish originally released on 30 May 1989 at 29.5 cm (Patterson et al. 1992).

Three hundred sixty nine hours of setline effort went into collecting 16 white sturgeon (Table 4). Due to difficulty in tracking volunteer angling hours, rod and reel effort was not recorded. However, approximately the same amount of effort went into collecting 15 white sturgeon using rod and reel.

DISCUSSION

Snake River Population Estimate

We did not obtain a white sturgeon population estimate between Swan Falls Dam and Brownlee Dam during 1992; only one white sturgeon was caught. I initially chose a randomized sampling design to eliminate sampling bias created by sampling only in areas known to be inhabited by white sturgeon. However, this method may be too inefficient. Eighty-five percent of our sample sites were in water shallower than 4.6 m. Similar sampling efforts in the CJ Strike Reservoir to Bliss Dam stretch on the Snake River turned up very few white sturgeon in water less than 4.6 m deep (Jim Chandler, Idaho Power Company, personal communication).

Available data suggests that white sturgeon numbers in this reach are low. Of the 59 fish caught by sport anglers in 1991, 16% were less than 0.9 m in length, 59% were between 0.9 and 1.8 m and 25% were greater than 1.8 m. In addition to angler catch data, studies by Lukens (1982) and Mabbott and Holubetz (1989) turned up limited numbers of white sturgeon below Swan Falls Dam. White sturgeon caught during these study periods were between 24 and 114 in in length. The majority of this work had been done in the upper 30 mi of the freeflowing section where anglers have historically caught the greatest number of white sturgeon.

Aging white sturgeon accurately is important to estimating annual mortality within a fish population. The most reliable method for estimating age and growth of white sturgeon is through examination of pectoral fin ray sections along with tagging studies for age validation (Brennan and Cailliet 1989). Using fin ray sections, Cochnauer et al. (1985) found that white sturgeon in this section grew faster than white sturgeon in other areas of the Snake River. Based on his results, most white sturgeon caught last year by anglers in the study area (0.9-1.8 m) should be between 8 and 20 years old.

Table 3. White sturgeon catch information for broodstock collection January 25 to February 28, 1993.

Date	River mile	Total length (cm)	Fork length (cm)	Front girth (cm)	Rear Girth (cm)	Sex	**Stage** b
Below CJ Strike Dam							
1-29	494	170	158	66	58	F	2
1-29	494	178	160	68	34	F	2
1-29	492	189	166	64	60	F	2
Upper CJ Strole Pool							
2-2	504	112	125	57	N/A	N/A	
2-3	503	230	178	94	80	F[a]	4
2-4	503	120	105	40	36	N/A	
2-4	503	110	97	35	32	N/A	
2-4	503	192	167	72	52	F	2
2-4	503	110	96	40	35	N/A	
2-6	505	162	142	57	51	F	2
2-6	503	182	162	72	60	M	
2-6	503	212	190	70	61	M[a]	
2-8	503	187	164	70	61	M	
2-8	503	200	172	75	65	F	2
2-9	507	77	67	25	20	N/A	
2-11	503	205	187	77	67	F	2
2-11	503	215	192	92	77	F[a]	3
2-11	503	224	197	90	72	F	2
2-11	503	184	164	66	62	M	
2-11	503	210	182	77	67	F[a]	3
2-12	503	240	210	81	72	M	
2-24	503	185	160	65	80	N/A	
2-24	503	240	225	82	72	M	
2-24	504	240	210	90	77	F	2
2-25	505	160	135	85	84	M	
2-26	503	120	100	45	42	N/A	
2-26	503	175	152	62	49	F	2
2-26	503	160	140	62	50	F[a]3	
2-26	504	75	67	25	22	N/A	
2-26	503	237	180	71	32	M	
2-27	504	215	187	77	70	M	

[a] Transported to the College of Southern Idaho.

[b] Stage 2: Moderate-size ovary; 200-500 mm oocytes; "salt & pepper" -like particles may be present.
Stage 3: Large ovary; white to yellowish or grey color; 1.5-2.5 mm oocytes
Stage 4: Presence of large, dark oocytes, 3.0+ mm

Table 4. Setline and angling effort for broodstock collection during January and February 1993.

	Effort		Total fish caught	
	Angling	Setline	Angling	
Below CJ Strike	*	100	1	2
Upper CJ Strike Pool	*	269	14	14
TOTALS	*	369	15	16
			31	

* Total angling hours were not recorded.

Spawning habitat may be limited in this river section. Scott and Crossman (1973) suggest that white sturgeon require rocky river bottoms in swift currents near rapids and waterfalls for spawning. Outside of the canyon below Swan Falls very little of this habitat exists within the study area. Though McKechnie and Fenner (1971) suggests that muddy areas may be important foraging habitat they are insufficient for spawning. Mud coats the eggs, causes them to lose adhesiveness and, if thick enough, will eventually suffocate them.

Mid-summer temperatures may also be a limiting factor to population abundance. When we began our study in late summer 1992, surface water temperatures in the study area reached 20°C. Water temperatures greater than 20°C are potentially lethal to white sturgeon eggs and fry (Hanson et al. 1992). Thermographs placed throughout the study area may assist us in monitoring water temperature fluctuations throughout the year.

White sturgeon prefer deeper water (McConnel 1989), but 85% of our sampling sites in the freef lowing section were in water less than 5 m deep. A change from simple random sampling to stratified random sampling would intensify fishing effort in better sturgeon habitat. We cannot develop any conclusions about the population size in the study area from this years work. Angler records provide us with enough information to be confident that there is a small population in the study area. With a modified sampling design, we may be able to collect enough white sturgeon to make a reasonable population estimate.

RECOMMENDATIONS

1. Change sampling methods from simple random sampling to stratified random sampling. Sample habitats **less** than 5 m deep at low intensity. Intensely sample habitat greater than 5 m deep.

2. Install thermographs at three to four sites within the study area to document temperature in white sturgeon habitat.

3. We should collect and age fin rays to provide us with information on the present age structure of the population.

ACKNOWLEDGEMENTS

Thanks to bio-aide Joe Fowble for assisting in data collection and for fabrication and maintenance of project equipment. To everyone on other IDFG projects who loaned us equipment. Jack Siple and all volunteers who assisted in broodstock collection. The Idaho Power Company white sturgeon crew for loaning us gillnets and allowing us to ride along and learn in the beginning. Dunn for typing and formatting this report.

LITERATURE CITED

Brennan, James S., and Gregor M. Cailliet. 1989. Comparative Age-Determination Techniques for White Sturgeon in California. Transactions of The American Fisheries Society 118:296-310.

Cochnauer, T.B., J.R. Lukens, and F.E. Partridge. 1985. Status of white sturgeon, Acipenser transmontanus, in Idaho. In P.P. Binkowski, and S.I. Doroshov, editors. North America sturgeons. Dr. W. Junk Publishers, Dordrecht, Netherlands.

Conte, Fred S., Serge I. Doroshov, Paul B. Lutes, and Elizabeth M. Strange. 1988. Hatchery manual for the white sturgeon Acipenser transmontanus Richardson: with application to other North American Acipenseridae. US Fish and Wildlife Report. 103 pp.

Hanson, David L., Tim G. Cochnauer, John D. DeVore, Henry E. Forner, Jr., Tom T. Kisanuki, David W. Kohlhorst, Paul Lumley, George McCabe, Jr., Anthony A. Nigro, Steve Parker, Don Swartz and Al Van Vooren. 1992. White Sturgeon Management Framework Plan. PSMFC. 198 pp.

Horton, Bill. 1992. Sturgeon Permit Data. Idaho Department of Fish and Game. Unpublished data.

Lukens, James R. 1982. River and stream investigations: Snake River fisheries investigations. Survey of Fish populations in Snake River, Shoshone Falls to Lower Salmon Falls Dam. Status of White Surgeon populations int he Snake River, Bliss Dam to Givens Hot Springs. Period Covered: 1 March 1981 to 28 February 1982. Project # F-73-R-4. Idaho Department of Fish and Game. 35 pp.

Mabbott, Brent, and Terry Holubetz. 1989. Regional Fisheries Management Investigations: job No. 3(GC)-c. Region 3 (Boise) Rivers and Streams Investigations. Project # F-71-R-12. Idaho Department of Fish and Game. 86 pp.

McConnell, William J. 1989. Habitat Suitability curves for White sturgeon. TGS Tech. Inc. Fort Collins, CO. 8 pp.

McKechnie, R.J., and R.B. Fenner. 1971. Food habits of white sturgeon Acipenser transmontanus in San Pablo and Suisun Bays, California. California Fish and Game 57:209-212.

Patterson, Terry, Kimberly A. Apperson and John T. Siple. 1992. Snake River White Sturgeon Culture 1987 to 1990. Idaho Department of Fish and Game. 116 pp.

Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada, Bulletin 184. Fisheries Research Board Canada. Ottawa, Canada.

Appendix A.

PIT tact number	Hook size	Recapture data	Capture method
Below CJ Strike Dam			
7F7DOA2816	14/0	no	setline
7F7DOB7679	14/0	no	setline
7F7DOB71OD	9/0	no	rod/reel
Upper CJ Strike Pool			
NO TAG	6/0	no	rod/reel
7F7DO3OE35	6/0	no	rod/reel
7F7DOB667F	6/0	no	rod/reel
7F7DOD5041	6/0	no	rod/reel
7F7DOD7544	6/0	no	rod/reel
7F7DOCO671	6/0	no	rod/reel
7F7DOB7360	6/0	no	rod/reel
7F7DOD6E3D[a]	6/0	yes	rod/reel
7F7DOD600A	6/0	no	rod/reel
7F7DOB731B	6/0	yes	rod/reel
7F7DOB7629	6/0	yes	rod/reel
7F7DOD706E	6/0	yes	rod/reel
7F7F442A3D	16/0	yes	setline
7F7F436O5F	14/0	yes	setline
7F7DOD6424	6/0	no	rod/reel
7F7DOB662A	12/0	no	setline
7F7DOD7946	14/0	no	setline
7F7O0D7AO7	---	no	setline
7F7DO3O55D	6/0	no	setline
7F7DOD5O6C	14/0	no	setline
7F7F187O7E	16/0	yes	setline
7F7F137D48	12/0	yes	setline
7F7DOD6876	14/0	no	setline
7F7DO26659	14/0	no	setline
7F7DOD5C47	12/0	no	setline
7F7FO8O42E[b]	12/0	yes	setline
7F7F136F31	6/0	yes	rod/reel
7F7DOD700F	14/0	no	setline

[a] This fish had Idaho Power Company surgical monofilament still intact, however, no PIT tag was detected, so we put in a new one.

[b] This was a hatchery fish released on June 30,1989 at 29.5 cm total length.

Submitted by:

Gretchen O. Kruse-Malle
Senior Fisheries Technician

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Steven M. Huffaker, Chief
Bureau of Fisheries

Virgil K. Moore
Fisheries Research Manager

SIGNPAGE